

## **REMARKS**

The Applicant's representative left a message for the Examiner requesting withdrawal of finality, which appears to have been erroneously noted on the Office Action Summary. Since this Office Action is the first office action on the merits following a request for continued examination and amendment of the claims, it would be improper to make the Office Action final. Indication that finality is withdrawn is respectfully requested.

The Applicant amends claim 17 and adds new claim 34. Claim 34 is a method that can only be used to produce the aircraft fuselage of claim 17, and claim 17 is an aircraft fuselage that can only be made by the steps of the method of claim 34.

Paragraphs [0020] and [0026] – [0029] provide support for the additional limitation added to claim 17 from claim 33.

### **Nonobviousness**

None of the cited references, whether taken alone or in combination, teach or suggest all of the limitations of claim 17, as now amended. The Office Action fails to provide any reason that a person having ordinary skill in the art would modify the cited references to achieve the structure recited in claim 17. Therefore, the Office Action fails to establish *prima facie* obviousness over claim 17, as now amended.

Westre et al. fails to teach or suggest any carbon fibers that are coated with a nitride or a carbide bond, and fails to teach or suggest embedding such fibers in a metallic material, and fails to teach or suggest that the exterior skin comprises a silicate fiber material. These features solve the technical problem that the exterior skin of the aircraft is enhanced in its fire safety and at the same time is solid and firm enough to be incorporated as a bearing element into the mechanical strength bracing to absorb and transfer the forces and torques acting on the bracing of the fuselage. It would not have been obvious to a person having ordinary skill in the art, and no person having ordinary skill in the art would have any expectation of success, to achieve both enhanced fire resistance and absorption and transfer of such forces using the hybrid material recited in claim 17.

Westre et al. merely teaches a structure with layers of a metallic foil and layers of a resin matrix. According to Westre et al. the resin matrix comprises parallel reinforcing fibers (col. 2, line 67 to col. 3, line 2 and Fig. 1 and 3b) and provides a continuous strip. Contrary to

this, the fibers disclosed in Suyama et al. (as seen in Fig. 1) are anti-parallel to enhance the stability of the matrix. Suyama et al. explicitly states that the orientation of the fibers in parallel is a disadvantage (column 2, lines 15 to 20). Therefore, a person skilled in the art would not find any motivation to combine the teachings of Westre et al. and Suyama et al. in the way suggested in the Office Action. A person having ordinary skill in the art would have no expectation of success in combining the teachings of Westre et al. and Suyama et al., which teach very different processes and structures. *Arguendo*, even if the person in the art would combine Westre et al. and Suyama et al., the result would not yield the limitations of claim 17, as now amended, because by replacing the resin matrix of Westre et al. by the ceramic matrix of Suyama et al. the person skilled in the art would achieve a completely different structure than recited in claim 17. Claim 17 adhesively binds layers of a composite material, a silicate fiber material and a metallic material with a coating of a resin layer by embedding in a resin, the carbon fibers being embedded in the metallic material. Even if combined, no person having ordinary skill in the art would have any reason to insert a resin layer between a ceramic layer and a metal layer, and the coated carbon fibers embedded in the metallic material and the silicate fiber materials are entirely omitted from the cited references whether taken alone or in combination.

Even if a combination of Westre et al. and Suyama et al. is combined with Newell, the combination fails to teach or suggest the limitations of claim 17. Newell discloses hollow fibers which are aligned in parallel to each other, and a person having ordinary skill in the art would have no expectation at combining the features of these three references as suggested in the Office Action, when Suyama et al. teaches and suggests a different orientation. Furthermore, adopting the fibers of Newell would undermine fire resistance of the composite, because the hollow fibers **20** of Newell constitute flow through passages **410** and enable fluids and gases to pass through the structural element (column 2, lines 15 to 17). Therefore, a person skilled in the art would have no expectation of success combining the references as suggested in the Office Action.

Heitkamp discloses a composite sandwich panel structure with honeycomb core layers 2, 3 and fire barrier membranes 4, 5, 6. This structure is entirely different than the structure recited in claim 17, because the structure is not capable of being an exterior skin of an aircraft that also absorbs and transfer loads from the mechanical strength bracing components. Thus, a

person skilled in the art would have no motivation to combine the teachings of Heitkamp with the other documents. Even if combined with the other references, Heitkamp fails to teach or suggest all of the limitations omitted by the other cited references that are recited in claim 17. Therefore, the Office Action fails to establish *prima facie* obviousness over the limitations recited in claim 17.

The Office Action admits that Westre et al. fails to disclose carbon fibers coated in a nitride or a carbide bond and fails to disclose any fibers embedded in metal.

The Office Action admits that Suyama et al. fails to disclose any fibers embedded in a metal and only relates to embedding fibers in a ceramic material. There is no equivalence between the embedding of fibers in a ceramic, which is practiced for increasing fracture toughness of a brittle ceramic matrix, and embedding fibers in a ductile metal matrix, which metal matrix does not require improved fracture toughness. Indeed, there is no teaching that adding fibers to a metal matrix material improves fracture toughness in a metal, or any other logical reason for such a selection, in the Office Action.

Applicant traverses the official notice taken on page 4 that the teaching of Suyama et al. and Newell are “art recognized functionally equivalent means for providing an aircraft reinforced composite material.” Indeed, the Heitkamp reference, which is cited for an asbestos paper layer, distinguishes many prior art composite materials and clearly states: “Each of the components plays a synergistic part in the overall design and construction” in column 6, lines 26-17 of its specification. Moreover, Heitkamp carefully discloses the types of layers and all the possible substitute materials for those layers in its specification, and nothing in Newell teaches or suggests the interchangeability of ceramic and metal layers in its particular composite structures. Therefore, Official Notice is improper, because a person having ordinary skill would expect significant differences in properties of a composite material by substituting brittle ceramic for ductile metal layers or vice versa. The Office Action cites to claim 1 of Newell for the proposition that metals and ceramics are interchangeable, but this hypothesis is unsupported by any facts. Claim 1 of Newell merely states:

1. A structurally reinforced, creep resistant composite component, comprising: composite metal or ceramic matrix material, a plurality of carbon-coated ceramic hollow reinforcing fibers arranged in said metal or ceramic matrix material in substantial parallel alignment with each other communicating distinct surfaces of said

component, wherein herein one of said communicated surface is exposed to a high speed flow of fluid and said carbon-coated ceramic hollow fibers communicate said one surface with a source of suction, whereby said component functions as a laminar flow control panel.

Nothing is taught or suggested in claim 1 about the interchangeability of “composite metal” and “ceramic matrix” materials. Instead, the claim is merely claiming a component made with either of these materials (but not both). Also, the hollow fibers are chosen as carbon-coated ceramic fibers specifically engineered for this purpose. A carbon coated ceramic hollow fiber is not a carbon fiber coated with a nitride or a carbide bond, as recited in the claims. Likewise, the specification of Newell is silent about the interchangeability of composite metal and ceramic matrix materials. The Office Action makes the mistake of equating silence about whether two alternative materials choices in a particular reference are equivalent with support for the equivalency of two materials choices. This is error. Substituting ceramics for metallic materials is an inherently unpredictable art, as ceramics are brittle and are expected to have substantial crack propagation, while metals are ductile and resist crack propagation. While it is possible that the particular “composite metal” of Newell, i.e. a binder-powder metal slurry as disclosed in column 3, ll. 61-67, has characteristics more associated with a ceramic (due to the presence of the binder and oxides at particle interfaces) than a metal, this says nothing about the interchangeable of materials having fibers embedded in a metallic material “consisting of” certain metals. Newell’s composite metal is not a metallic material consisting of a metal. Instead, the hollow fibers that are coated with carbon are embedded in a binder slurry with either metal or ceramic powders held together by the binder. The binder-metal slurry of Newell does not suggest carbon fibers of any type embedded in a layer of a metallic material consisting of an aluminum, a titanium, an aluminum alloy, a titanium alloy and a combination thereof. At best, Newell teaches fibers embedded in a metal powder – binder slurry but not embedded in the metal, itself, and even if the binder is a fugitive binder, the reference fails to teach or suggest carbon fibers coated in a nitride or carbide bond embedded in a metallic material consisting of aluminum, titanium or their alloys, as recited in the claims, whether the reference is taken alone or combined with other references.

*Arguendo*, even if the suggested structures of Newell, i.e. a metal or ceramic powder-binder slurry coating carbon-coated hollow fibers, is combined with the other cited references, none of the cited references teach or suggest the equivalency of metals and ceramics, as suggested in the Office Action, and even if combined, none of the cited references teach:

...a sandwich design comprising layers of a composite material and a metallic material, and carbon fibers coated with a nitride or a carbide bond being embedded in the metallic material, the metallic material consisting of a layer of an aluminum, a titanium, an aluminum alloy, a titanium alloy and combinations thereof, the layers of the composite material and the metallic material being adhesively bonded together by a coating of an adhesive resin layer between the layers, such that the exterior skin is a hybrid material comprising layers of the composite material, the adhesive resin layer and the metallic material layer molded by further deformation processing after layering of the layers, such that the exterior skin is shaped by molding as an exterior surface of the aircraft fuselage and is joined to the components of the mechanical strength bracing of the fuselage structure...

as recited in Applicant's claim 17, as now amended.

The fracture toughness of ceramics and metals is known in the art to be at opposite ends of the spectrum. No person having ordinary skill in the art would substitute a metal for a ceramic, or vice versa, in a structural aerospace application calling for the opposite with any expectation of success. Any successful substitution of a ceramic structural material for a metallic structural material requires years of experimentation and many thousands of engineering-hours to achieve, if it is ever achieved. Even if achieved, the substitution of a ceramic for a metallic structural material results in a structural material with very different performance parameters including fracture toughness, notch sensitivity, fatigue life, strength, high temperature creep and the like. No person having ordinary skill in the art would consider metal and ceramic materials to be equivalent substitutes. The knowledge of the inherent differences between metals and ceramics is notoriously well known in the art. Therefore, it would not be obvious to a person having ordinary skill in the art to combine Westre et al. with Suyama et al. to achieve a composite – resin – ceramic sandwich with carbon fibers in the ceramic and to replace the ceramic matrix of Suyama et al. with a metal layer, as suggested in the Office Action. Suyama fails to teach or suggest any such substitution.

It is error to base a conclusion that a substitution of a metal and ceramic is equivalent solely on the teachings of Newell, which is drawn merely to a particular “novel composition comprising a metal or ceramic matrix material [made from a powder-binder slurry] including a reinforcing system of [hollow] fibers ... while overcoming all the drawbacks and disadvantages of known similar fiber-reinforced compositions,” as disclosed in the summary of the invention in column 2 of Newell. Newell’s novel composition is unlike any other composition in the references as cited, because it uses powder processing to form its compositions with binders to hold the particles together.

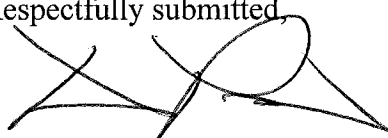
The Office Action uses improper hindsight, based on the Applicant’s own disclosure, to find in Newell a teaching or suggestion that is absent there. *In re NTP, Inc.* (Fed. Cir. 8/1/11) reversed the Board of Patent Appeals and Interferences for improperly relying “on hindsight reasoning to piece together elements to arrive at the claimed invention.” According to the Fed. Cir. “[c]are must be taken to avoid hindsight reconstruction by using ‘the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit.’” Citing *Grain Processing Corp. v. American-Maize Prods. Co.*, 840 F.2d 902, 907 (Fed. Cir. 1988) (quoting *Orthopedic Equip Co. v. United States*, 702 F.2d 1005, 1012 (Fed. Cir. 1983)). The only way to combine the teachings of the unique compositions of the Newell reference for a powder-binder slurry with hollow tubes that provide a passage for gas to flow through, the fiber reinforced ceramic matrix composite of Suyama, and the metal layers of Westre joined together with a fiber reinforced resin plies between the metal layers in order to achieve the structure recited in claim 17, as amended, is to use hindsight reasoning. Even if such references would be considered for combining by a person having ordinary skill, which is unlikely, there is no reason to suggest that the references would be combined in the way suggested in the Office Action and recited in the claims. Each of the references teaches and suggests different reasons for using its own particular formulary, and none of the cited references, or anything known in the art, teaches or suggests any reason to choose the particular structure recited in claim 17, whether taken alone or in combination.

For these reasons, Applicant traverses the rejection of the claims under Section 103. No new matter has been added. Applicant respectfully requests reconsideration of the pending claims, and allowance of all of the claims, which are now in condition for allowance.

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Respectfully submitted,



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